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Scurf, Black Rot, and Stem Rot of Sweet Potatoes

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Growers suffer serious losses every year from sweet potato scurf, black rot, and stem rot in their fields. The three diseases have much in common. All are caused by fungi that can live in the soil for several years after sweet potatoes have been grown. These disease-producing fungi may be carried to the seedbed on diseased sweet potatoes and into the field on diseased sprouts. Because of similarities in the diseases, certain of the measures that provide control from their attacks are similar. By adopting the best control measures, well-informed growers can avoid heavy losses.

SWEET POTATO SCURF

Sweet potato scurf costs New Jersey growers many thousands of dollars every year. The reduction in crop value is due not to reduced yields but to the unsightly appearance and poor keeping qualities of the diseased potatoes.

Scurf may occur as small, circular, brown or black spots on all underground parts of the sweet potato plant. Where these spots are numerous, they may coalesce to form a uniform brownish patch, which, in severe cases, may cover the entire potato. On red-skinned varieties the infected areas become almost black. Severely affected potatoes may develop cracks. The disease is wholly on the surface, but the skin is usually injured so much that moisture escapes. The potato then shrivels excessively in storage. (See figure 1.)

The fungus that produces this disease lives through the winter on diseased potatoes and on decaying plant parts in the soil in the seedbed and in the field. When diseased potatoes are placed in the seedbed, the fungus spreads from the potato to the sprouts. In the field the fungus grows down these sprouts to the developing sweet potatoes. Observations made over a number of years in New Jersey suggest that most scurf occurring in the field comes from diseased sprouts. Sprouts or potatoes may also become infected by the scurf-producing fungus living on organic matter in the soil.

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Fig. 1. Scurf on sweet potatoes

The grower's first care, then, must be to set out only healthy sprouts in his field. As the sprouts may become diseased from use of diseased potatoes for bedding or from infested soil in the seedbed, these sources of infection should be eliminated. The grower can not be sure, even after close inspection, that sweet potatoes are entirely free from scurf or from spores of the fungus on their surfaces. Nevertheless, he should select, for bedding, potatoes that appear to be disease-free, and then, as an extra precaution, dip them in a suitable fungicide (see "Seed Treatment", p. 6). The next step is to bed treated potatoes in sand in which sweet potatoes have never been grown. As a final precaution, the sprouts should be dipped in a suitable fungicide (see "Sprout Treatments," p. 6) before they are set in the field.

Although these precautions will usually ensure a crop of sweets that is very nearly free from scurf, they are not always effective. This is true chiefly because seed and sprout treatments cannot be expected to have a marked effect on the scurf-producing fungus already in the soil. Where infection from the soil is common (in black or heavy soils) a long rotation would be of value. Scurf is usually more severe in soils to which organic matter has recently been added.

Work in New Jersey by Dr. R. F. Poole showed that scurf caused by field infection can be reduced by broadcasting sulfur on the soil about a month before the plants are set. Since too much sulfur may reduce yields considerably, this treatment should not be used on soil unless it is advised by a qualified person who has investigated such points as pH and texture of soil and disease records.

As scurf gradually increases in severity during the fall months, potatoes from the areas most affected should be harvested first. Areas where scurf is usually not a problem may be left until a later date.

BLACK ROT

Losses caused by black rot are not nearly so great as they were a decade or more ago. This is because growers, in general, have adopted sound control measures.

The fungus that causes black rot affects the potatoes in the field and in storage. It may also affect sprouts in the seedbed or plants in the field.

The most conspicuous injury is to the potatoes, in the form of circular spots of various sizes. When the disease is not followed by other rot-producing organisms, the spots usually remain shallow, averaging about $\frac{1}{4}$ inch in depth. (See figure 2.)

In the seedbed, black cankers of varying size may occur on the young sprouts, usually at the bases. They may cause dwarfing and yellowing of the foliage and eventually death of the sprouts. The infection spreads through the underground parts of the plant and may extend upward to include an inch or more of the stem above ground. Wilting frequently accompanies severe root infections. Symptoms on plants in the field are very similar to those on the sprouts.

The fungus lives over winter on diseased potatoes in storage houses. Here it may spread to sound potatoes, becoming a major storage problem. The fungus also lives on certain weeds such as the wild morning glory, and spores of the organism commonly remain in the soil for a few years and may infect future crops.

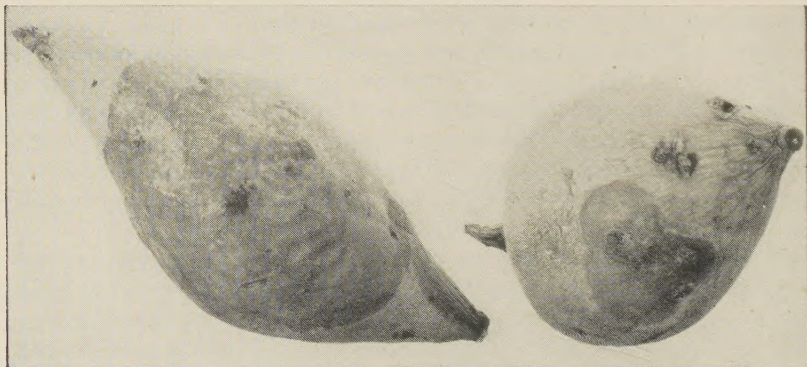


Fig. 2. Black rot of sweet potatoes

Here again, as in the control of scurf, the grower's first care should be to set out only disease-free sprouts in his field. To obtain sprouts free from black rot, rigid seed selection is important. This involves careful inspection of the seed for black rot just before bedding in spring, since potatoes that go into storage free from the disease may contract the malady before they are taken out. Seed and sprout treatments and seedbed sanitation are also necessary.

Treated sweet potatoes should be bedded in sand that is free from the black rot organism. Where manure is used to heat the seedbed, it should be devoid of sweet potato refuse.

In fields where black rot is a perennial problem, crops should be rotated and wild morning glory eradicated.

STEM ROT

Stem rot (yellows) has long been one of the most destructive diseases of sweet potatoes in New Jersey. In fact, losses from stem rot over a period of years are probably equal to losses from all other field diseases of the sweet potato combined. Stem-rot losses are caused almost entirely by yield decreases.

The fungi that cause stem rot enter sweet potato plants chiefly through injured roots and may then grow extensively in the water-conducting tissues of the roots and stems. A slightly yellowish tinge of the foliage is the first sign of the disease. This slight off-color is soon followed by more pronounced yellowing and by dropping of the older leaves, and finally by wilting and death of the entire plant. Wilting is less severe in wet seasons than in dry seasons. If the stem of a diseased plant is split near the base, the inside will be found to have many dark streaks instead of the uniform light color of healthy vines. The darkening may also extend into the potatoes.

The organisms causing stem rot live over winter in diseased potatoes and in the soil. When diseased potatoes are bedded, they produce diseased sprouts. These may or may not show signs of the disease. When planted in the field, they introduce the stem rot fungi into the soil, where they may live a long time.

As with scurf and black rot, farmers can do much to control stem rot by bedding disease-free potatoes in clean sand and by dipping the roots of the resulting sprouts in an effective fungicide (see "Sprout Treatments", p. 6). They will find it helps, too, to avoid injuring the plant roots by improper application of fertilizers or use of a too-concentrated starter solution. The best way to get disease-free seed potatoes is to locate healthy hills by splitting the stems before the

vines are frozen and select seed stocks only from plants whose stems show no internal darkening.

The sprout-dipping suggested will prevent or delay field infection. A treatment of this type protects the sprouts while wounds caused by pulling are healing over. In fields where stem rot is a perennial problem, a long rotation is the only known method that will appreciably reduce the severity of the disease.

CONTROL—GENERAL

In discussing control of scurf, black rot, and stem rot, we have recommended, in all cases, that disease-free sprouts be set in the field. As pointed out, the best way to produce disease-free sprouts is to bed treated seed in sand that is free from disease-producing organisms. As a further aid, the sprouts thus produced should be dipped in a suitable dipping material before they are set in the field.

Seed Treatment

Semesan Bel 1-8 has been most generally used for seed potato dip treatments in New Jersey. For seed treatment, it is preferred to Fermate or Karbam, Tersan, Phygon, or Speargon because, of these fungicides, it alone is known to be effective against black rot. If the sweet potatoes are bedded soon afterward, the Semesan Bel treatment is comparatively safe.

Sprout Treatments

Dipping sprouts in a satisfactory fungicide is often the most important single operation in controlling scurf and early stem rot infections. Since these two diseases are so generally distributed throughout the sweet potato growing areas of New Jersey, most farmers will want to use a fungicide that is effective in the control of both diseases.

Semesan Bel (an organic mercury compound) is good not only for seed treatments, but for sprout treatments as well. Although it usually does not retard growth for more than two or three days, it may, under some conditions, do considerable injury to young plants. When rapid drying of the plants is likely, as with plants set in unusually dry soil, and especially if the humidity of the air is also low, injury is likely to be extreme. This is especially true if the plants are succulent or weak from any cause. Injury is also likely to be exaggerated if the weather is too cool to allow the sprouts to start well. Under unfavorable conditions such as these, the grower might do well to use a weaker dipping solution (1-12½) than the regular strength (1-10).

Tersan (tetramethyl thiouram disulfide) 1-5 is effective against scurf and stem rot. Its value against black rot is unknown. This material has not been observed to injure sweet potato sprouts either in

experimental or commercial use. It is, therefore, an excellent choice for use on sprouts to be set in very light soil or under conditions where Semesan Bel may be expected to produce injury.

Fermate or Karbam (ferric dimethyl dithiocarbamate) 1-5 is perhaps the most effective sprout treatment now available for the control of scurf. It is not very effective against stem rot, and its efficiency in black rot control is not known. This dip treatment has not been observed to produce injury to the treated sprouts even in the lighter sands.

Phygon (dichloronaphthoquinone)) has not been used commercially in New Jersey as a sprout treatment. In our experiments (1-5) it has been very effective in controlling scurf. It has been somewhat less effective in controlling stem rot. *Phygon* seems to be safe for use.

Spergon (tetrachloro-para-benzoquinone) 1-8 gives good control of stem rot without injuring the treated sprouts. It is not effective enough against scurf or black rot to justify its use except under special conditions.

Puratized Agricultural Spray (phenyl mercuritriethanol ammonium lactate) 1-5,000 has shown considerable efficiency in controlling scurf. Further work is needed, however, before it can be suggested for commercial use.

Seedbed Sterilization

Unless sweet potatoes are bedded in sand that is free from disease-producing organisms, control will be difficult. The grower is advised to replace the sand in his plantbeds every year with clean sand that has not been used before for growing sweet potatoes. As a precaution, it is wise to scrub all solid parts of the bed thoroughly with a solution of formaldehyde (usually sold under the trade name formalin), 1 pint in 6 gallons of water, or with a solution of copper sulfate (blue-stone), 1 pound in 5 gallons of water, before clean sand is put in. Any sand in corners or on bottoms of beds that is not cleaned out should be thoroughly soaked with the solution. This practice is of particular value if diseased sprouts were produced in the bed the previous year.

If the grower uses the same sand for more than one season he should sterilize it to kill any germs that may be present. He can do this effectively with steam or with liquid formaldehyde, or Formalin.

To sterilize the sand with formaldehyde, thoroughly saturate it with a solution of the chemical, at a strength of 1 pint of the commercial liquid in 12½ gallons of water. Sprinkle this material slowly and uniformly on the sand, at the rate of 1 gallon to each square foot of

bed surface. Then cover the sand with paper or burlap for 12 to 24 hours. A more convenient, but slightly less effective method, is to apply the same amount of formaldehyde with less water (1 pint to 6 gallons at $\frac{1}{2}$ gallon per square foot or 1 pint to 3 gallons at $\frac{1}{4}$ gallon per square foot of bed surface) and wash it in with clear water. When disinfecting the soil in the winter, it may be wise to apply formaldehyde solution of higher concentration, since it may be difficult to dry the sand enough for use if large amounts of water are added.

If this treatment is made near planting time, be sure that no odors of formaldehyde can be detected from the soil before the sweet potatoes are bedded, otherwise the plants may be seriously injured.